JUNE, 2000

REGENERATION RESEARCH NEWSLETTER

Asilomar State Beach

EIGHTH INTERNATIONAL SYMPOSIUM ON NEURAL REGENERATION

Meeting Report

The Eighth International Symposium on Neural Regeneration was held from December 8-12, 1999 at the Asilomar Conference Center, Pacific Grove, California. The meeting was cosponsored by the Medical Research Service of the Department of Veterans Affairs, the Spinal Cord Research Foundation of the Paralyzed Veterans of America, the National Institutes of Health (National Institute of Neurological Disorders and Stroke), the Christopher Reeve Paralysis Foundation (a merger of the American Paralysis Association and the Christopher Reeve Foundation), and the Eastern Paralyzed Veterans Association. The symposium was organized by Dr. Fredrick Seil (VA Office of Regeneration Research Programs), and the program planning committee included Drs. Susan Bryant (University of California, Irvine), Mary Bartlett Bunge (University of Miami School of Medicine), Edward Hall (Parke-Davis Pharmaceutical Research, Ann Arbor), Marston Manthorpe (Vical, Inc., San Diego), Ken Muneoka (Tulane University), Marion Murray (MCP Hahnemann University), John Peacock (VA Medical Center and University of Nevada, Reno), Fredrick Seil and Suzanne Szollar (VA Medical Center and University of California, San Diego). Guest participants at the program planning committee meeting were Drs. Vivian Beyda (Eastern Paralyzed Veterans Association) and Paul Hoffman (Department of Veterans Affairs Central Office) and Ms. Lisa Hudgins (Paralyzed Veterans of America).

The symposium was initiated with a keynote address by Dr. Martin Raff (University College, London) entitled "Control of oligodendrocyte numbers." Dr. Raff noted that oligodendrocyte numbers could be increased or decreased by varying the numbers of

myelin-receptive axons, and that the likely mediating molecule for the control by axon numbers was neuregulin. Featured speakers were Drs. John Sladek (The Chicago Medical School) and Glenn Hatton (University of California, Riverside). Dr. Sladek, whose title was "Neural repair strategies: factors, grafts, gene therapy or all of the above?," reviewed the history of neural transplantation, and related neural transplantation to other repair strategies. Dr. Hatton discussed the formation or reduction of double synapses on magnocellular hypothalamic neurons associated with glial retraction or ensheathment in different functional states in a presentation entitled "Function related neuronal-glial plasticity in the adult mammalian hypothalamus." The other platform presentations were given under six topic headings, each with talks by invited speakers.

Strategies for Spinal Cord Injury Repair

The first session was chaired and introduced by Dr. Bradford Stokes (The Ohio State University). Dr. Michael Bracken (Yale University) presented "Pharmacologic therapy for acute spinal cord injury: a systematic review of the evidence." His conclusion was that high dose (30 mg/kg administered over 15 minutes followed by 23 hours of an infusion of 5.4 mg/kg/hr) methylprednisolone, when administered within 8 hours of injury, was the only pharmacologic therapy shown to have efficacy in a Phase III randomized controlled trial. Dr. Fred Geisler (Chicago Institute of Neurosurgery and Neuroresearch and Rush University Medical School) followed with "Demographics analysis and pharmacologic effects in the GM-1 ganglioside acute spinal cord injury study." He compared recovery in acutely injured patients treated with GM-1 ganglioside (100 mg/day for 56 days) versus placebo, and concluded that the GM-1 group demonstrated earlier recovery than the placebo group. The next presentation was "Cell death and tissue repair after experimental spinal cord injury" by Dr. Michael Beattie (The Ohio State University), who studied secondary injury and repair after contusion lesions in experimental animals. Necrosis was evident at the lesion center in the spinal cords early after injury, and apoptosis appeared in many cells after 6 hours, followed by circumferential and rostrocaudal spread over days and weeks. In addition to cell death, tissue repair and regeneration were also evident, providing a coordinated picture of cell death and repair that may be amenable to manipulation. Dr. Herbert Geller (UMDNJ-Robert Wood Johnson Medical School) discussed "Guidance of neuronal processes by astrocyte-derived extracellular matrix molecules." He found that individual regions or fragments of laminin-1 and tenascin-C can alter outgrowth and guidance of neurites in culture that differ from that of the parent molecules, suggesting that extracellular matrix molecule fragments resulting from proteolysis following injury can impact regeneration in ways different from the intact molecules. Dr. John Bethea (University of Miami) reflected on "Spinal cord injury-induced inflammation: a dual edged sword." He noted that pro-inflammatory cytokines released after injury may elicit cytotoxic responses, but anti-inflammatory cytokines such as IL-10 may reduce the cytotoxic events and even improve functional recovery. Gaining a better understanding of trauma-induced inflammation may lead to development of more effective strategies for treating spinal cord injuries. Dr. Phillip Popovich (The Ohio State University) continued with this theme in his presentation entitled "Targeted immune therapies: strategies to promote repair of the injured spinal cord." He concluded that the manifestation of immune-mediated injury or repair is largely determined by local microenvironmental cues and systemic influences which regulate immune cell function (such as neuroendocrine mechanisms). Differences in location and severity of injury may determine whether inflammatory leukocytes provoke CNS regeneration or degeneration.

Impact of Neuroprosthetic Applications on Functional Recovery

After an overview by the session chairman, Dr. John Chapin (MCP Hahnemann University), Dr. Paul Cheney (University of Kansas) reviewed "Cortical motor areas and their properties: implications for neuroprosthetics." One of the key questions considered was what specific cortical areas might provide optimal signals for prosthetic control. An interesting finding in monkeys was that target muscles of individual corticospinal neurons formed functional synergies involving multiple muscles, a critical piece of knowledge for prosthetic design. Dr. David Krupa (Duke University Medical Center) then presented "Role of corticofugal projections in immediate somatosensory plasticity." He described experiments dealing with immediate thalamic reorganization after deafferentation of a portion of the facial whiskers by subcutaneous injection of lidocaine. This reorganization was significantly reduced after cortical inactivation, suggesting that thalamic plasticity is dependent upon corticofugal projections as well as ascending trigeminal pathways. Dr. John Kaas (Vanderbilt University) closed the session with "Reorganization of somatosensory and motor cortex after peripheral nerve or spinal cord injury in primates." Examples he gave included monkeys with forelimb amputations in which primary somatosensory cortex formerly representing inputs from the hand represented the face and stump of the arm instead, and motor cortex formerly devoted to moving digits represented movements of the shoulder and arm stump. These changes appeared to depend in part on the growth of new connections.

Neurotrophins and Activity-Dependent Plasticity

The session was chaired by Dr. Fredrick Seil (VA Medical Center, Portland and Oregon Health Sciences University) in the absence of Dr. Hans Thoenen (Max-Planck-Institut,

Martinsried) due to illness. Dr. Serge Marty (INSERM, Hôpital de la Salpêtrière, Paris) addressed "Differences in the regulation of neuropeptide Y, somatostatin and parvalbumin levels in cultured hippocampal neurons by neuronal activity and BDNF." BDNF (brain-derived neurotrophic factor) mediates the activity-dependent regulation of neuropeptide Y but not of somatostatin, whereas parvalbumin expression develops during activity blockade. McLean Bolton (Duke University Medical Center) described "Long-term regulation of excitatory and inhibitory synaptic transmission in hippocampal cultures by brain-derived neurotrophic factor." She found that BDNF potentiates both excitatory and inhibitory synaptic transmission, but via different mechanisms. Regulation of excitatory transmission by BDNF was not dependent on activity, as blocking action potentials with tetrodotoxin had no effect on the magnitude of the synaptic enhancement. Dr. Fredrick Seil discussed "Neurotrophins and activity-dependent inhibitory synaptogenesis." He reported that the TrkB receptor ligands, BDNF and neurotrophin-4 (NT-4), promoted development of Purkinje cell inhibitory axosomatic synapses in organotypic cerebellar cultures in the absence of neuronal activity. Such cultures exhibited control rates of spontaneous cortical discharge after recovery from activity blockade, while untreated or neurotrophin-3 (NT-3) treated activity blocked cultures, which had reduced numbers of Purkinje cell axosomatic synapses, became hyperactive after release from activity blocking agents. Dr. Bai Lu (National Institute of Child Health and Human Development) presented "Molecular mechanisms underlying BDNF modulation of hippocampal LTP." BDNF modulates LTP (long-term potentiation) at CA1 synapses by enhancing synaptic responses to high frequency stimulation, which appears to be achieved primarily by facilitating vesicle docking. There is also evidence for a postsynaptic effect of BDNF, as BDNF modulates postsynaptic glutamate receptors in hippocampal neurons. Dr. Arthur Konnerth (Technical University, Munich) concluded with "Neurotrophin-evoked rapid excitation of central neurons." He presented evidence obtained with whole-cell patch clamp recordings in acute brain slice preparations that low concentrations of BDNF and NT-4 evoked action potential firing within milliseconds in various CNS neurons. The rapid excitation of neurons by neurotrophins was similar to that of a conventional excitatory neurotransmitter, glutamate.

Plasticity of the Injured Spinal Cord: Retraining Neural Circuits to Promote Motor Recovery

Dr. Bruce Dobkin (University of California, Los Angeles), who substituted for Dr. Reggie Edgerton (University of California, Los Angeles) as chair, opened the session with an account of "Use of functional magnetic resonance imaging (fMRI) to assess plasticity in locomotor networks." Some human subjects with chronic incomplete spinal cord injury with retained walking ability showed enlarged cortical representations and higher activations during passive movements of ankles and toes, while no activation was found in subjects with clinically complete lesions. Serial fMRI studies during retraining of locomotion may reflect changes in network activity. Dr. Keir Pearson (University of Alberta) talked about "Adaptive plasticity in the walking system of the cat." Cats recovered function within two weeks after weakening of the ankle extensor muscles by denervation. Associated with the recovery was an increase in the magnitude of EMG activity in non-denervated muscles. The recovery and increase in EMG activity were use-dependent, as they were delayed if the leg was immobilized for a few days following muscle weakening. Dr. Blair Calancie (University of Miami) presented "Neural plasticity as revealed by the natural expression - both voluntary and involuntary - in humans after spinal cord injury." He described clinical and neurophysiological studies of the pattern and time course of recovery of movement in human subjects after acute spinal cord injuries of varying degrees. These data can help to provide a more accurate assessment of the extent of injury and a more accurate prediction of the eventual outcome. Dr. Anton Wernig (University of Bonn) discussed "Locomotor (Laufband) therapy in SCI persons." He reported the results of treatment of human subjects with incomplete spinal cord injuries by walking on a treadmill while supported in an upright position by a harness. This therapy achieved considerably better results than conventional treatment in both acute and chronic spinal cord injury cases.

Candidate Cells for Transplantation into the Injured CNS

Following an introductory presentation by the session chairman, Dr. Itzhak Fischer (MCP Hahnemann University), Dr. Michal Schwartz (Weizmann Institute of Science, Rehovot) addressed "Autoimmune T-cells enhance recovery from severe spinal cord injury: immune neuroprotection." In past work, she and her coworkers had shown that activated macrophages facilitated regeneration in experimentally transected spinal cord. In more recent work they showed that treatment with autoimmune T-cells specific for myelin basic protein dramatically enhanced recovery after spinal cord contusion. Dr. Almudena Ramón-Cueto (Universidad Autónoma de Madrid) reported on "Olfactory ensheathing glia transplants as tools to restore function and repair injured spinal cords of adult mammals." Olfactory bulb ensheathing glia were transplanted into adult rats with T8 transected spinal cords. Transplanted rats all recovered specific locomotor and sensory functions and showed evidence of axonal regeneration across the transection site, while nontransplanted rats showed neither functional recovery nor long-distance axonal regeneration. Dr. Mahendra Rao (University of Utah) followed with "Lineage re-

stricted precursors for transplantation - cell types, sources and methods of isolation." He reviewed the types and relative merits of precursor cell populations available for replacement or drug delivery purposes. Multipotent stem cells, neuronal precursors and multiple classes of glial precursor cells have been characterized, and can be distinguished by antibodies to cell surface epitopes. Various precursor populations have been transplanted and their ability to integrate and differentiate into appropriate phenotypes has been analyzed. Dr. Darwin Prockop (MCP Hahnemann University) presented "Stromal cells from bone marrow for cell and gene therapy of diseases of the central nervous system." Bone marrow evidently contains stem-like cells for a variety of non-hematopoetic tissues. Some marrow stromal cells differentiated into mature astrocytes when injected into striatum or hippocampus, and there is at least suggestive evidence of neuronal differentiation as well. Marrow stromal cells have been gene-engineered to secrete L-DOPA after implantation into the basal ganglia of rats. Dr. Virginia Lee (University of Pennsylvania School of Medicine) ended the session with "Differential effects of spinal cord gray and white matter on process outgrowth from grafted human NTera2 neurons (NT2N, hNT)." She described properties of postmitotic neurons generated from a clonal human embryonal carcinoma cell line by treatment of the cells with retinoic acid. NT2N neurons grafted into the spinal cords of immune compromised mice integrated into both gray and white matter sites in location-appropriate manners, extending processes that differentially responded to gray and white matter cues. Such cells have potential for transplantation therapy in human subjects.

New Directions in Regeneration Research

After introductory remarks by Dr. Jeffrey Kordower (Rush University Medical School), who chaired the final session, Dr. Frank Longo (VA Medical Center and University of California, San Francisco) described "Small molecule compounds mimicking neurotrophins." He considered approaches to development of synthetic small molecule neurotrophin mimetics with optimal profiles of stability, tissue penetration and targeted biological actions. Compounds targeted to specific neurotrophin receptors have the potential to mimic the entire range of functions or a subset of functions of a given neurotrophin, thereby avoiding some undesirable properties for a specific application. Dr. Andrew Blight (Acorda Therapeutics) reported on "Clinical studies of K^+ channel blockade in chronic spinal cord injury." He summarized some of the difficult questions that need to be addressed in a clinical trial of 4-aminopyridine (4-AP). There is good evidence from basic studies of beneficial effects of 4-AP on the injured nervous system, and these effects are consistent with a direct action through the blockade of "fast" K^+ channels in demyelinated axons, but much remains to be done with regard to clinical application. Dr. Patrick Tresco (University of Utah) addressed "Tissue engineering strategies for repairing the nervous system." Two general approaches that are being developed are the use of encapsulated, cell-containing implants as focal, sustained delivery systems to supply neuroactive substances or growth factors, and the use of guidance systems that bridge or reconnect severed or damaged nerve tracts. Fundamental issues regarding host response inhibition of these approaches remain a major challenge to clinical implementation. The final symposium speaker, Dr. Raul Saavedra (MCP Hahnemann University), presented "*In vivo* neuroprotection of injured CNS neurons by a single injection of a DNA plasmid." He described a rapid method to introduce genetic information into CNS cells in order to protect neurons soon after injury, namely injection of a DNA plasmid that codes for the antiapoptotic gene, B-cell lymphoma 2 (Bcl-2). A single injection of Bcl-2 plasmid just proximal to a spinal cord hemisection prevented the death of axotomized Clarke's nucleus and red nucleus neurons in adult rats. The plasmid injection technique could be used to deliver other potential therapeutic genes, such as neurotrophins, into injured CNS neurons.

In addition to the platform presentations, free communications were presented in the form of posters. Seventy-five posters were displayed in two sessions. Abstracts of both speaker and poster presentations were published in the May, 2000 issue of *Experimental Neurology (163:279-309)*. The symposium proceedings, exclusive of the poster presentations, will be published by Elsevier Science as a volume in the *Progress in Brain Research* series entitled "Neural Plasticity and Regeneration," edited by Fredrick J. Seil. The Ninth International Symposium on Neural Regeneration will again be held at the Asilomar Conference Center and is scheduled for December, 2001, with specific dates to be determined.

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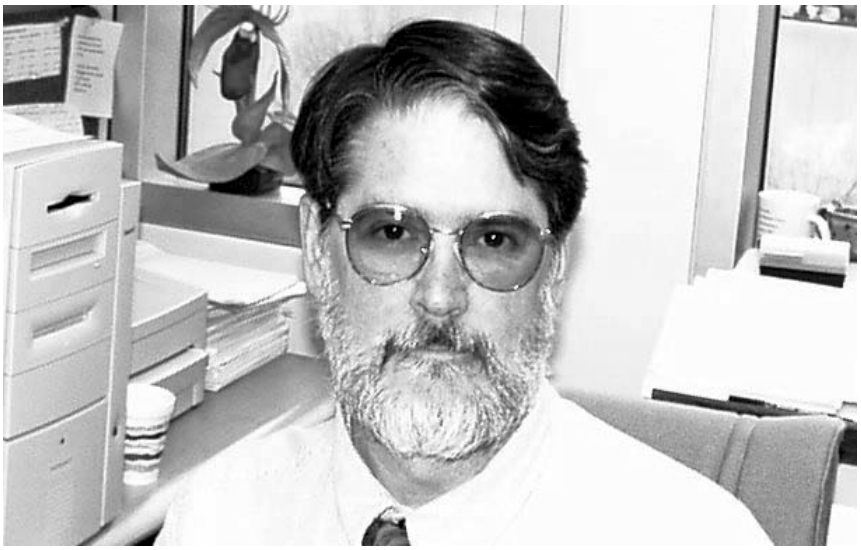
SYMPOSIUM ORGANIZER CHANGE

The Department of Veterans Affairs has selected Roger Madison, Ph.D. of the Durham VA Medical Center and Duke University to replace Dr. Fredrick Seil as organizer of the international symposia on neural regeneration at Asilomar, beginning with the December, 2001 symposium. Dr. Seil will retire in July, 2001, but will continue his association with the symposia as a member of the program planning committee.

Dr. Madison brings years of experience in neural regeneration research, especially of the peripheral nervous system, to the position of symposium organizer. He received his bachelor's degree from the University of Illinois and his master's and doctoral degrees from Duke University. The title of his doctoral dissertation was "Regulation of Neuronal Plasticity: The Role of Afferent Input in Sympathohippocampal Sprouting," with Dr. James N. Davis as his advisor. Following two years of postdoctoral training in Dr. Richard Sidman's laboratory at the Harvard Medical School and Children's Hospital, Dr. Madison remained in Boston for another five years as a member of the Harvard Medical School and Children's Hospital faculty before returning to Duke in a faculty position. His major research interests are 1) axonal regeneration and 2) neural plasticity and growth factors. His research has been supported primarily by the National Institutes of Health and the Department of Veterans Affairs. He has published a variety of papers in the field of neural regeneration research, a number of which deal with promotion of nerve regeneration and reinnervation accuracy by the use of nerve guides.



Roger Madison

ORRP

With Dr. Seil's retirement, the VA Office of Regeneration Research Programs (ORRP) will cease to exist. This office, which was Dr. Betty Uzman's brainchild during her tenure as Director of the VA Medical Research Service, was established in 1981 to promote regeneration research in the VA system. It was decided to place the office in the "field" rather than in Washington, DC, and the Portland VA Medical Center agreed to host it, with Dr. Seil, a neurologist/neuroscientist, as the Director. The purview of the office was non-neural as well as neural regeneration. Dr. Seil soon recruited an Advisory Board of scientists with expertise in different aspects of regeneration research, but with a majority representing the nervous system, as the majority of VA supported grants dealing with regeneration were focused on the nervous system. A variety of functions was explored by the ORRP and its Advisory Board in an attempt to promote regeneration research, including conferences, workshops, regeneration research fellowships, providing assistance with grant writing, tracking regeneration research for VA Central Office, publishing and circulating this newsletter, establishing liasons with other agencies that supported regeneration research, presenting research updates to clinicians caring for spinal cord injured patients, attending meetings to acquire current information on both neural and non-neural regeneration research, and establishing the international symposia. The most enduring and high impact activities for promotion of regeneration research were publication of this newsletter and establishment of the biennial international symposia, the first of which was presented in 1985. The newsletter has an international circulation of 4,500, and has featured information on and summaries of meetings, both neural and non-neural. The symposia have provided a forum for presentation of the most current developments in neural regeneration research and, because of the informal atmosphere, have fostered the development of many collaborations among attendees. The symposia have also gathered together as cosponsors the different organizations supporting neural regeneration research. The VA and the Paralyzed Veterans of America were the first partners in support of the symposia, but were soon joined by the National Institutes of Health, followed by the American Paralysis Association (now the Christopher Reeve Paralysis Foundation) and then the Eastern Paralyzed Veterans Association. The ORRP may soon be gone, but let us hope that the newsletter, the symposia, and the partnership among the sypmposium cosponsors will endure.

EDITOR'S COMMENTS

Publications

I would like to point out three publications associated with the Eighth International Symposium on Neural Regeneration that have been scheduled for this year. The abstracts of all of the presentations, both platform and poster, were published in the May issue of *Experimental Neurology.* A summary of the platform presentations at the symposium appeared in the June issue of *The Neuroscientist.* The symposium proceedings will appear as volume 128 of Elsevier's *Progress in Brain Research* series at the end of the year. The volume, entitled "Neural Plasticity and Regeneration," edited by myself, will contain 31 chapters, including two by authors unable to attend the symposium due to illness, namely Drs. Hans Thoenen and Andy Hoffer. The book will be divided into six sections, like the symposium, but the order of presentation will be slightly different, so that the more clinically relevant material will be included in the first half, while the second half is devoted primarily to basic research. Hopefully the volume will have something to satisfy everyone interested in neural regeneration.

Symposium Session Proposals

If your favorite topic has not been presented at one of the international symposia, we encourage you to submit a proposal for a symposium session. The program planning committee is meeting on August 5 and 6, 2000, to formulate the program for the Ninth International Symposium on Neural Regeneration scheduled for December, 2001. Proposals may be received in the Office of Regeneration Research Programs as late as July 25, 2000 and still be considered, but earlier submission is recommended for advance distribution to committee members. Proposals will not be considered, however, if they are not submitted in an appropriate format. Instructions for preparation of a session proposal and a sample format may be obtained by telephoning (503-273-5193), faxing (503-721-7906) or e-mailing (seilf@ohsu.edu) us your fax number and we will forward them to you. As a reminder, a symposium usually consists of six topic sessions, three with a chairman plus six speakers and three with a chairman plus four speakers. The longer sessions are presented in the morning and the shorter sessions in the evening or late afternoon. The chairs introduce the sessions with a 15 minute overview of the topic, and the speakers generally give a 20-25 minute presentation, with the remaining 5-10 minutes for questions and discussion. It is not advisable to recruit speakers prior to submission of a proposal, as the program planning committee may drastically alter the composition of a session, if it is accepted, and invitations to speak are issued solely from the symposium organizer's office.

Future of the Symposia

I am confident that the international symposia at Asilomar will continue under Dr. Roger Madison's leadership in the tradition that has been established with the first eight of these symposia. Dr. Madison has attended previous symposia and is quite familiar with their pattern. The success of these symposia, however, is not due to a single individual, but to the combined efforts of many individuals, including a series of brilliant program planning committees, well crafted proposal submissions by conference attendees, creative poster presentations by many senior and student neuroscientists, overall excellent platform presentations by invited speakers, and the support of a core of regeneration research enthusiasts who never or rarely miss a meeting. These ingredients all remain, and the rest will be "business as usual."

Farewell

This will be the last issue of the *Regeneration Research Newsletter* to originate from this office. The idea for the newsletter came from Dr. Jerald Bernstein (VA Medical Center, Washington, DC and George Washington University), who served as editor of the first two issues. I remember the first issue (July, 1982) well for it had my picture on the front page, and the most frequent comment I heard about it was, "Would you buy a used car from that man?"

The newsletter did well in its first three years, and we published a number of featured articles in those days by people like Dr. Juan Fonseca, Director of the VA's Spinal Cord Injury Service, Lynn Phillips, National Research Director of the Paralyzed Veterans of America, Rep. Bob Edgar, Chairman of the Subcommittee on Hospitals and Health Care of the House Committee on Veterans' Affairs, Admiral M.D. Van Orden, Vice President for Research of the American Paralysis Association, and Dr. Pavel Rumyantsev, Director of the Institute of Cytology of the USSR Academy of Sciences, Leningrad. A slight stumble occurred in 1985 when there was a cut-back in VA funding, and the Paralyzed Veterans of America kindly published two issues of the newsletter for us in 1985 and 1986. Our VA funding for the newsletter was restored in 1987 and has been continuous ever since. At this point the primary focus of the newsletter became the international symposia on neural regeneration, which were started in 1985. As the newsletter was published once annually, issues alternated between featuring the program of a coming symposium or reporting on the topics of the recent past symposium. Other articles highlighted other meetings, the majority of them covering non-neural regeneration, usually written by members of the ORRP Advisory Board who represented systems other than the nervous system. These were excellent articles, and enlightened us all on the many developments in regeneration in other systems. Hopefully we were reasonably successful in providing a broad coverage of the rather immense field of regeneration research.

One of the more commented upon issues included a photoessay on what happens at Asilomar (June, 1997). As a parting shot, we would like to present another photoessay on Asilomar, of **people talking to people**. A fond farewell!

Martin raff explains it to Herb Geller

Lynn Beazley tries to convince Norman Saunders

Arthur Konnerth clarifies his point

Itzhak Fischer enlightens Virgina Lee

Wolfram Neiss discussing a poster with Susanna Coers

Rod Williams at a rare loss for words

SECOND ASIA PACIFIC SYMPOSIUM ON NEURAL REGENERATION

The Second Asia Pacific Symposium on Neural Regeneration will be held at the Sheraton Hotel in Xian, China from November 30 to December 3, 2000. The keynote speaker for the symposium is Dr. Albert Aguayo (Canada). The program will consist of a combination of platform and poster presentations, with the platform papers to be selected from submitted abstracts for presentation under one of four themes, including 1) Development and Plasticity of the Nervous System (Chair: Dr. Sarah Dunlop, Australia); 2) Role of Glia in CNS Regeneration (Chair: Dr. Kwok-Fai So, China); 3) Spinal Cord Injury and Repair (Chair: Dr. Gong Ju, China); and 4) Functional Recovery after Stroke (Chair: Dr. Frank Yatsu, USA). Abstracts not selected for platform presentation or abstracts that do not fit into one of these themes will be designated for poster presentation. In addition, there will be invited speakers who will address special topics in regeneration research. Speakers who have agreed to participate include Drs. Lynn Beazley (Australia), Michael Calford (Australia), Henrich Cheng (Taiwan), Alastair Compston (United Kingdom), Yutaka Fukuda (Japan), Tomas Hökfelt (Sweden), Mu-ming Poo (USA), Michal Schwartz (Israel) and Fredrick Seil (USA). Limited support is available for student attendance of the symposium. Student or postdoctoral fellow status must be established with a letter from the training director. Only those students/fellows presenting papers/posters at the symposium will be considered for support.

There is currently a call for abstracts (deadline: August 15, 2000). Inquiries for information about abstract format, registration, student support and other specifics about the symposium should be addressed to the symposium secretariat as follows:

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Xian is located in the geographical center of China, in an area referred to as the "cradle of Chinese civilization." Emperor Qin Shi Huang, the first ruler to unify China, established his capital near modern Xian more than 2,000 years ago, and the capital of China was located in the vicinity of Xian for thirteen dynasties. Emperor Qin, the subject of a recent Chinese film touring the USA under the title, "The Emperor and the Assassin," ordered the construction of the terra cotta soldiers that were unearthed in 1974 and are considered to be one of the most significant archeological finds of the 20th century. The life-size soldiers, found near the emperor's tomb, represent his imperial guard. Over 3,000 soldiers have been excavated, along with 96 horses and 11 chariots, and the excavation is still in progress. An optional tour of the archeological site will be available following the symposium.

Cosponsors of the symposium include the Fourth Military Medical University (Xian, China), the University of Hong Kong (Hong Kong, China), the University of Western Australia (Perth, Australia), the Harry Fang Foundation (Hong Kong, China), the Paralyzed Veterans of America (Washington, DC, USA), the Eastern Paralyzed Veterans Association (Jackson Heights, NY, USA) and the VA Office of Regeneration Research Programs (Portland, OR, USA). Program committee members include Drs. Fredrick Seil (USA), Chair; Kwok-Fai So (China), Co-Chair; Lynn Beazley (Australia); Sarah Dunlop (Australia); Yutaka Fukuda (Japan); Alan Harvey (Australia); Gong Ju (China); Geoffrey Raisman (UK) and Frank Yatsu (USA). Local organizing committee members are Drs. Gong Ju (Chair and *de facto* Symposium Organizer), Liang-Wei Chen, Kang-Jie Dang, Zuo-Jing Luo, Guo-Xiaong You and Si-Wei You. President Bo Su of the Fourth Military Medical University and Professor Sir Harry Fang of Hong Kong constitute the advisory committee to the symposium. Dr. Vera Yip of the University of Hong Kong has been instrumental in the organization of the symposium.

The Asia Pacific Symposium on Neural Regeneration was created in order to fill a need for a neural regeneration meeting in Asia. Many Asian neuroscientists are unable to come to the biennial international symposia on neural regeneration held at Asilomar because of the distance and expense. The meeting in Asia was designed to take place on alternate years from the symposia at Asilomar. The First Asia Pacific Symposium on Neural Regeneration was held in Hong Kong from December 3-4, 1998 (see June, 1999 issue of the *Regeneration Research Newsletter*). Over 150 neuroscientists attended, mostly from Asia, but with representation from all over the world. The success of this meeting provided encouragement for the organization of this year's meeting in Xian, and for scheduling the Third Asia Pacific Symposium on Neural Regeneration in Perth, Australia in December, 2002.